CHOLERA

HOW TO AVOID AND TREAT IT

HENRY BLANC M.D.

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CHOLERA

HOW TO AVOID AND TREAT IT

POPULAR AND PRACTICAL NOTES BY

HENRY BLANC, M.D., M.R.C.S.

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TO

LORD LYONS

G.C.B., P.C.

HER BRITANNIC MAJESTY'S AMBASSADOR AT PARIS

This Treatise is respectfully Dedicated

BY HIS MOST OBEDIENT SERVANT

THE AUTHOR

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PREFACE.

I PROPOSE in these practical notes to refer to well ascertained facts, and to avoid all theories and hypotheses. I do not wish to build a prophylaxis and a treatment of cholera on imaginary grounds; based on such foundations, my work would not only prove useless, but add to the uncertainty which already exists, and misguide, instead of affording the benefit which a summary knowledge of what we know about cholera will most certainly confer.

To those who have lived for years within the

endemic area of cholera, who have time upon time observed this dreadful scourge under its many features, and followed from place to place its ever-recurring deeds of sickness and death, to them devolved the task of studying this disease in all its bearings, and, by adding facts to facts, gaining an insight into the real nature of cholera. Nor have the officers of the Indian Medical Service turned a deaf ear to this appeal, and I am proud to record here among the many the well-known names of Murray, Macnamara, and Macpherson, as those of medical men to whose labours we are indebted for a knowledge of something positive and certain regarding the causes, the means of preventing, and the treatment of cholera.

I have not ignored the many valuable works

on this subject due to the pen of English, American, and French physicians; but the question I am treating has been better studied of late in India, and it is to Indian authors that I have applied for most of the facts on which alone a knowledge of cholera can be based, and which, added to the results of my own experience, are the subject of these notes.

Rue de la Paix 2, Paris:

September 1873.

Note.—This treatise was read 'en Assemblée Générale of the French Association for the Advancement of Sciences,' held August last, at Lyons; and owing to the very favourable reception given to it by the *savans* present at the congress, and to the expressed wish of many of them, I have decided on publishing it in English and in French.—H. B.

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CHOLERA:

HOW TO AVOID AND TREAT IT.

CHAPTER I.

THE CAUSES AND PROPAGATION OF CHOLERA.

Cholera is not an imaginary something, without substance or being, heaven born, floating about in the air, and wafted by the uncertain winds. The supposed influences of certain states of the atmosphere, the presence or absence of certain proportions of electricity or ozone, on the generation of cholera in the human body are purely hypothetical. More than that, no amount of over-crowding, no special telluric conditions, nor any circumstance deemed favourable to the breeding of diseases, will generate

cholera among men removed from its endemic influence.

These views have been very ably developed by Dr. Macnamara,* and I know of no fact which condemns them. Were it otherwise, how could we account for the local and limited outbursts of disease which mark the progress of cholera? This localised action—one of the characteristics of cholera—must be associated with something tangible and specific, and cannot be understood if it depends on any general atmospheric, or the so-called epidemic, influences.

Cholera is communicated by man to man. This power of contagion resides in the discharges of the individual attacked by cholera; the agent of this transmission is *generally* the drinking-water; but it may also be communicated less directly: for instance, through the air containing the particles of cholera, as when a

* *A Treatise on Asiatic Cholera.* London: 1869.

certain number of cholera patients are crowded together, or under certain circumstances that will hereafter be described.

I cannot here follow the distribution of cholera in the many epidemics that have prevailed in the East, nor describe their march when once they have gained access to Europe; but the following rules can be laid down:

Every outbreak of cholera beyond the confines of India may be traced back to Hindustan through a continuation of human beings affected with the disease, or through articles of clothing &c. stained with their dejecta.

Once cholera has gained a footing in Europe, it spreads in many diverging lines, always following man in his wanderings, never journeying faster than man can travel, and never appearing in a new locality unless introduced directly or indirectly by him.

The epidemic of cholera which is gradually

gaining ground in Europe began in India in the year 1867. I will briefly describe that outbreak, which has been carefully studied by two eminent Indian medical officers, Drs. Murray and Cutcliffe, as it well illustrates these two important facts—the transmission and the spread of cholera by man.

Dr. Macnamara* states 'that cholera was very prevalent at Allahabad and Benares in March 1867: the disease had not died out in the Bhurtpore territories during the cold weather; it existed there in February and March. The Rajah of Bhurtpore, with a large retinue, visited Hurdwar. Supposing, therefore, cholera to be a communicable disease, we can hardly wonder at its having broken out among the multitude of pilgrims assembled at Hurdwar in April 1867.

'The town of Hurdwar is situated on the

* Loc. cit.

banks of the Ganges, in a gorge of the Sewalick Hills, about thirteen miles from where the river escapes from the Himalayas. The elevation of the place is about a thousand feet above the level of the sea. The hills on which the town is situated are of tertiary formation, and are composed of massive strata of grey sandstone, covered in parts with a superstructure either of clay or loose boulder-gravel. Cholera had been unknown at Hurdwar during the nine years prior to 1867.

'The encamping-ground at Hurdwar consists of a narrow slip of land, nine miles long by three broad, with the river running through the middle of it. Dr. Cutcliffe considers that some twenty-two square miles were occupied by the camp, containing nearly three million pilgrims. The very best possible arrangements had been made with regard to the sanitation of this prodigious encampment.

'The pilgrims began to pour into the camp from the 1st of April, in vast numbers, from the plains, and to settle themselves down in the blocks laid out for them. On the 3rd of April the fair may be said to have commenced, though dense living streams stretched backwards for a long distance into the plains, and, with a volume steadily increasing up to the auspicious bathing-hour of noon on the 12th of April, continued to concentrate themselves at Hurdwar, and to pour out their multitudes on the encamping-ground.'

Dr. Macnamara remarks that it is important to notice here, that on the night of the 11th of April a very heavy thunderstorm burst over this vast unsheltered multitude; the rain lasted the whole night and throughout the following day; and, however perfect the conservancy may have been, this downfall of rain must inevitably have washed excrementitious matter

from the latrines and surface soil into the Ganges during the night of the 11th of April.

Dr. Cutcliffe gives the following account of what occurred on the 12th of April. The bathing-place of the pilgrims was a space 650 feet long by 30 feet wide, shut off from the rest of the Ganges by rails. Into this long narrow enclosure pilgrims from all parts of the encampment crowded as closely as possible from early morn till sunset; the water within this space, during the whole time, was thick and dirty—partly from the ashes of the dead, brought by surviving relatives to be deposited in the water of their river-god, and partly from the washing of the clothes and bodies of the bathers. Now pilgrims at the bathing-ghaut, after entering the stream, dip themselves under the water three times or more, and then drink of the holy water, whilst saying their

prayers. The drinking of the water is never omitted; and when two or more members of a family bathe together, each from his own hand gives to the other water to drink. On the evening of the next day, the 13th of April, eight cases of cholera were admitted into one of the hospitals at Hurdwar. By the 15th, the whole of this vast concourse of pilgrims had dispersed, and the encamping-ground was left a barren waste.

Dr. T. Murray has given a careful report of the events that occurred after the pilgrims left Hurdwar. He states that the immense crowd at Hurdwar having entirely dispersed by the 15th, the pilgrims passed at a favourable season of the year through a healthy country; supplies were abundant, and extensive arrangements had been made for their convenience. The moving mass crowded the road in a continuous stream for nearly a week at Meerut. This

pilgrim stream carried with it cholera, which lined the road with victims, whose funeral pyres studded the surrounding fields, or whose corpses were thrown into the canal or collected by the police and buried. The disease was communicated to the neighbouring towns and villages, and the pilgrims carried it with them to their houses over the whole of Hindustan.

There were cases of cholera on the 13th of April at the first stage on each of the four main lines of road from Hurdwar. I cannot insert here the tables and maps which Dr. Murray has appended to his valuable report; they give the clearest evidence that cholera was disseminated throughout the country by means of the infected pilgrims. He traced cholera south-eastward into Oude, southward to Allyghur, northward to Simla, and to the north-west to Peshawur and into Cabul. The disease reached Peshawur on the 11th of May,

and the Civil Surgeon of the station states 'that no cases had occurred in the place for years, and not until after the arrival of the Hurdwar pilgrims. By the 21st the disease was epidemic in the city; cholera spread to the European troops, and carried off ninety-two men.

From Peshawur the disease crossed over into Cashmere and Afghanistan; in that country it broke out with much virulence in July, and did not cease till September. Towards the end of 1867 it reached Persia, where it remained until the autumn of 1868.

From Persia cholera has invaded Europe, and is now prevalent in Germany, parts of Italy, Sweden, America, and Russia; and it will still further close upon us, and claim victims in England and in Southern Europe also.

We could not desire a better illustration of a violent outburst of cholera due to contaminated drinking-water. Dr. Macnamara, after recording

Dr. Snow's Broad Street case, Dr. Richardson's and Dr. Farr's investigations into the spread of the disease, sums up the outbreak at the Hurdwar Fair in the following words:*

'Turning now to India, we have a remarkable illustration of the fact in the instance of the outbreak of cholera at Hurdwar in 1867. First, we have evidence of the assembling of an enormous congregation of pilgrims, some of whom had come from districts and villages in which cholera was prevalent, but the disease did not spread among them until the downpour of rain occurred on the 11th of April, the night before the great bathing-day. The assembled crowd (three millions in number) having been soaked to the skin for twelve hours, rushed down in a body to the river with their wet clothes on, and drank of its water, which must then inevitably have been contaminated with any organic mat-

* Macnamara, loc. cit.

ter washed off their saturated cotton garments. Within the twenty-four hours, cholera burst out in all directions amongst these unfortunate people, and they afterwards disseminated it throughout the country.'

The epidemic of cholera in America during 1866 clearly proves also the spread of cholera by means of contaminated drinking-water. From the reports of the Washington War Department, we learn that cholera was introduced among the troops in July, and spread to New Orleans and along the stations down the Mississippi. The following extracts are from the reports of Surgeon McParlin, and of Assistant-Surgeon Hartsuff:

'The troops at the barracks have enjoyed great immunity from disease. The 116th Regiment United States Coloured Troops, camped near the Sedgwick Hospital, and supplied thence with cistern water, has continued entirely free

from cholera. Quite recently, on muster out of the 81st United States Coloured Troops, the 116th was moved into quarters in the city. The supply of distilled and rain water for a day or so was scant, and some of the men used hydrant water. Soon two cases of cholera occurred. Pure water was supplied, and there have been no more cases in the regiment.'

'The 9th Regiment United States Coloured Cavalry and the 39th United States Infantry were supplied, but not sufficiently, with distilled water, until the cisterns of the Sedgwick were repaired, filled, and furnished rain water to them. At first the distilled water, sent up hot in casks, could not become cool before it was needed. The men preferred to drink the river water, because it was cold, and did so against orders and repeated warnings, accepting the risk of disease rather than wait for the water to be cooled and aerated. Case after case of choleraic

diarrhœa followed. Critical inspection failed to develop any other probable cause except the use of river water, and a recommendation was made to move the regiment away from the river far enough to prevent the men obtaining it. To avoid moving, the cavalry put on a strong guard to keep the men from the river, and cistern water was supplied from the Sedgwick Hospital. Cholera since then has ceased in the regiment. The 39th United States Infantry has been moved to the ground adjoining the hospital, and receives cistern water from the hospital. Its sanitary condition is good.'

Another remarkable instance of the power of infected drinking-water is mentioned by Dr. Macnamara. It is found in the absence of cholera among the hill tribes of Bengal. These low hills stretch away from Orissa down into Nagpore and Central India. They are inhabited by the aborigines of the country. The

tribes have the greatest aversion to the people of the plains, and these look on the hill tribes as unclean creatures, whose touch even is to be avoided; and to partake of the food, water, or clothing belonging to a hill man is sufficient to destroy the caste of the orthodox Hindoo. As long as the hill tribes remain in their mountains they have no communication whatsoever with the men of the plains. Cholera is more or less prevalent in the lowlands, very exceptionally in the hills, although many of the localities inhabited by the hill tribes are quite adjacent to places where cholera is always present. There is nothing in the mode of living of the hill tribes which confers this exemption from cholera; hygiene does not flourish among them, and they are more dirty and less select in their food than the men of the plains.

I must mention also that there is nothing in the slight elevation of these hills to which this

immunity can be ascribed. Many times cholera has prevailed with great intensity in the Himalayas, even at Simla, situate about 7,000 feet above the level of the sea. It is not due, either, to the nature of the soil. The hills are formed of metamorphic rocks, which are found in many parts of India, and which nowhere protect from outbreaks of the disease.

The question is entirely one of non-communication; their drinking-water is not polluted by choleraic evacuations, as the Hindoos will not in any way use it. But when the hill man leaves his home and repairs to the plains, he soon falls a victim to cholera. Many of them resort to the tea-gardens of Assam and Cachar, where they work as coolies. The death-rate among them from cholera is very great, and they are known to be extremely sensitive to the disease.

The instances given above afford material proofs that cholera is communicated by man to

man, the drinking-water being, as we have said, the most ordinary medium of this communication; but to establish this fact beyond any possible doubt, it would be necessary to make direct experiments, and to drink, or cause others to drink, water contaminated with cholera dejecta. Even in the interest of science, this cannot be done; however, certain facts occurred in India, which I will now relate, and which settle this point beyond dispute.

Dr. Macnamara gives the following instance:* 'I may mention the circumstance which occurred, and in which the most positive evidence exists as to the fact of fresh cholera dejecta having found their way into a vessel of drinking-water, the mixture being exposed to the heat of the sun during the day. Early the following morning a small quantity of this water was swallowed by nineteen persons (when partaken of, the liquid

* Macnamara, loc. cit.

attracted no attention, either by its appearance, taste, or smell); they all remained perfectly well during the day, ate, drank, went to bed, and slept as usual.

'One of them, on waking next morning, was seized with cholera; the remainder of the party passed through the second day perfectly well, but two more of them were attacked with cholera the next morning; all the others continued in good health till sunrise of the third day, when two more cases of cholera occurred. This was the last of the disease; the other fourteen men escaped absolutely free from diarrhœa, cholera, or the slightest malaise. In this case it is certain that the contaminated water was once, and once only, partaken of. Its effects were, that, out of a party of nineteen healthy men who swallowed it, five were attacked with cholera within seventy-two hours; the remaining fourteen individuals were ab-

solutely unaffected by the poison. These details leave us no reason to doubt that water contaminated by the fresh dejecta of a patient suffering from cholera produced the disease in five out of nineteen people who swallowed it, and that independently of either the season, nature of the soil, or any other appreciable circumstance, all of which were remarkably in favour of the persons attacked by the disease. Nor was cholera prevalent in the place.

'I am assured it had not visited the locality for several years, nor has it, as far as I am aware, appeared there since.'

Dr. Murray, in his Report,* expresses himself as follows on this point:—'The human body appears to be the chief medium of reproduction or multiplication and dissemination of the poison. This is fully proved by the history of the

* *Report on the Treatment of Epidemic Cholera.* By John Murray, M.D. Calcutta : 1869.

progress of the epidemic attacks in India, Europe, and America. It is the opinion arrived at in the Report of the International Congress at Constantinople in 1866. The history of the Hurdwar epidemic in 1867 showed that the disease radiated with the pilgrims from one focus in all directions from 300 to 700 miles, advancing in strict conformity to their rate of travelling, and being accelerated by the railway to Mooltan.

'There are numerous well-authenticated cases of the poison having been mixed with the water of wells and tanks, those using the water being attacked by the disease.

'There were two remarkable instances during the "Hurdwar epidemic" of the inhabitants being attacked by cholera on the second day after the poison had been communicated to the village tanks; in one instance, from a pilgrim suffering from cholera having bathed in it, and remained

on the banks during the day; and in the other, after the clothes of a man who had died from cholera were washed in it.'

What are the conditions under which water contaminated with cholera discharges will produce the disease in an otherwise healthy person? Cholera stuff, like organic matter, obeys certain laws; heat and moisture are necessary to its development. It is difficult to establish positive rules on this point, but from clinical facts and physical observations, it appears that water containing cholera discharges will attain its maximum of poisoning effects within the forty-eight hours, provided the water be at a temperature above forty-five degrees.

Dr. Macnamara, who has made many experiments on contaminated water, states:* 'Supposing we mix a sufficient amount of cholera dejecta with a gallon of water, so as to make

* Macnamara, loc. cit.

the infusion slightly opaline, and then place the mixture out in the sun in tall glass vessels. If this experiment be conducted under the heat of our Indian sun, we shall find, on examining the water at the end of twenty-four hours (especially in the early morning), that the vibrio stage of decomposition, or change in the organic matter, is in full force, the surface of the fluid being covered with large vibriones. On the following morning the same thing will be observed; but on the third day ciliated infusoria will have appeared in the fluid; and about the eighth day, or even sooner, bubbles of gas will be seen rising to the surface of the liquid, and the sides of the vessel will be lined with confervoid growths. Now I am prepared to state that the contaminated water, which was certainly poisonous during the vibrio stage of decomposition of the cholera stuff, may be drunk with absolute

impunity after the bubbles of air have begun to form in it, and the confervoid growth has taken the place of most of the ciliated infusoria.'

Dr. Macnamara also believes that immediately the organic matter has passed through its vibrio stage, it becomes harmless; not that he gives any importance to the vibriones themselves—for him they merely indicate a stage of decomposition during which the poison is at its highest point of intensity. Without being so positive as the talented author I have frequently quoted, I am of opinion that the organic matter in which resides the cholera poison will, exposed to heat and moisture, undergo further changes, and after a while become inert; but I deem it prudent not to be too positive regarding the duration of the infecting power of water containing cholera discharges, and I would always look on such

water with suspicion, even should its examination not reveal the presence of vibriones.

Water containing organic matter should always be distrusted, but never more so than during the prevalence of cholera. In the water tainted with cholera discharges nothing beyond organic matter has ever been discovered; there are no special germs, no new growths; and from the numerous experiments carried out under the orders of the Government of India by two Indian medical officers, Drs. Lewis and Cuningham, we are in a position to state that, beyond mucous and epithelial cells, nothing special has been found in the discharges and in the blood of cholera patients.

Secondary, and far remote in frequency, comes the transmission of cholera, and its propagation by other media of communication. But before entering into further details, I wish to be very explicit on this point—there is

nothing contagious or infectious in the touch or breath of a cholera patient. The poison is always in the discharges; and it is to a want of proper sanitary measures and to neglect, that the disease is communicated, be it through the drinking-water or through the vitiated atmosphere. If a room be small and badly ventilated; if many cholera cases are crowded together; if the dejecta are allowed to remain in or about the rooms; if they cling in a dried state to articles of furniture, bedding, &c., it is but natural to expect that persons breathing or swallowing these cholera particles will contract the disease. It is a matter of doubt whether the contagion can take place through the lungs; but it is very certain that the fomes of the cholera discharge can attach themselves to the mucous membranes of the mouth and nose, and, impregnated with mucus or saliva, be swallowed.

Dr. Murray states:* 'The disease appears to be propagated in and near drains and sewers. Decomposition facilitates the dissemination, and probably aids in the reproduction or germination of the poison.

'It is allowed by all that defects in the purity of the air and water, overcrowding, improper food or clothing, bad conservancy, and all sanitary defects which act prejudicially on the general health, predispose to the action of the cholera poison. These defects have existed and still exist in many parts of the world, without the appearance of cholera; still, experience shows that in this contaminated soil or atmosphere, the choleraic poison, when *imported*, flourishes and spreads; whilst its progress or development is stunted or limited where these sanitary defects do not exist. Over-crowding and imperfect ventilation appear to be peculiarly favourable to the spread of the disease.

* Loc. cit.

'There is abundant concurrent evidence that contact with the evacuations from cholera patients, or with articles of clothing &c. contaminated by them, and using public latrines, have been followed by attacks of the disease.

'Visiting places recently occupied by cholera cases, as buildings and camping-grounds, has in many instances been followed by attacks of the disease.'

Although atmospherical and meteorological circumstances cannot generate cholera, still they have some influence on its development and spread. In Europe these atmospherical modifications on the march and progress of cholera are perhaps less evident than in India, the area of endemic cholera; cold somewhat arrests the progress of the disease, and this should be, if we have to deal with an organic poison requiring a certain amount of heat for its development. Yet it may be said that cholera prevailed during the intense cold of a Russian winter.

This is easily explained; we know that Russian houses are overheated in winter; the moisture and heat present in such dwellings will be highly favourable to the development of the cholera stuff; moreover, cholera discharges would be thrown out of doors, and as snow is usually taken near the dwellings in place of water, which is not obtainable, we can easily understand that very severe cholera will prevail under these conditions.

In Calcutta, where cholera is more or less present all the year round, the effects of seasons seem to have a great influence on spread of the disease; but this is only apparent, and, with a knowledge of the country, the cause will be found here, again, to reside in the contaminated state of the drinking-water.

Dr. Macpherson says:* 'Attempts which

* Dr. Macpherson. *Cholera in its Home.* London: 1866.

have been hitherto made to connect the occurrence of cholera with particular passing states of the atmosphere, and especially with barometric pressure or electrical conditions, or winds, or the uncertain ozone, have not been very successful. Meteorological changes which appeared to influence one outbreak were found absent in another, or the circumstances would be reversed. Still, though it is difficult to apply meteorological changes in detail to explain the phenomena of the appearance of cholera, yet meteorological changes on a large scale have much influence on the disease.'

If we take the cholera death returns of Calcutta for twenty-six years, they will be distributed as follow, according to the seasons:—

Three hot and dry months have .	47,427	deaths.
Three cold and dry months have	23,632	,,
Three hot and moist months have	11,354	,,
The three transition months have	21,882	,,

From this table it is evident that the three

hot and dry months produce, in the endemic area of cholera, four times as many deaths by cholera as the three hot and wet months, and about twice as many deaths as the cold and dry months; while these slightly exceed the transition ones in their number of deaths.

In Calcutta the temperature of the cold months is far more favourable to the development of the cholera contagion than an average European spring or autumn; if, then, we find that at Calcutta the cholera death-rate is at a minimum during the cold months, whilst it reaches its highest point during the hot and dry months, we must seek beyond atmospherical conditions for the cause of this excess, and it will be found to exist in the drinking-water.

During the hot and dry months, rivers, tanks, and wells get more and more dried up; cholera stuff will, consequently, if allowed to have access to these water supplies, contaminate

them all the more, as the amount of water in them will be less. If this be correct, we should find that the greater the heat, the less water there will be, and that cholera will then reach its maximum—and so it is. If we examine by months the cholera death-rate for twenty-six years, as given by Dr. Macpherson, we find that the minimum mortality in Calcutta from cholera during that period was in August; from that month it slowly but gradually increases, until it reaches its maximum in April. The following table* leaves no doubt on this point:—

Months	Cholera	Rainfall. Inches
August	3,440	14·4
February	9,346	0·42
March	14,710	1·13
April	19,382	2·4
May	13,335	4·29
June	6,325	10·1

* Macpherson, loc. cit.

March, April, and May are the hottest and driest months in Calcutta. The greatest cholera death-rate is in April; falling slightly in May, when the rainfall, we find, has increased from two inches and a fraction to four inches and a fraction, and coming down considerably in June, also a hot month, but during which the rainfall has increased to ten inches. Intense heat, heavy showers, lessened water supply—all conditions favourable to the development of organic matter—characterise the season during which cholera reaches its highest degree of intensity in its endemic area.

CHAPTER II.

THE MEANS OF PREVENTING AND AVOIDING CHOLERA.

I HAVE endeavoured, and I trust with some success, to show that cholera is a disease communicated by man, that this transmission takes place generally through the medium of the drinking-water contaminated with choleraic discharges, and exceptionally through the atmosphere containing the exhalation or the dried-up particles of the dejecta.

I believe that, if cholera were not at the same time a highly preventible disease, I would have hesitated to record so openly my opinion. The very name of cholera inspires a deadly fear, and it would have been cruel to deprive the helpless victims of this scourge of

the kind and affectionate attendance of friends, and to frighten away those whose constant presence a cholera patient so much requires.

The prophylaxis of cholera offers no great difficulties. It is simply this: to destroy, by chemical agents or by other means, the poison which resides in the discharges; to protect the drinking-water from all contamination by choleraic evacuations; to establish and entertain in rooms used by cholera patients a good ventilation, and to avoid the dissemination of cholera particles by means of efficient disinfectants; to impress upon the community at large, as well as upon individuals, the precepts of a sound hygiene.

I will in this chapter also refer to facts only; and it is with the confidence that personal experience alone can give that I am able to proclaim that, by applying to the prophylaxis of cholera serious sanitary measures, we shall be

rewarded with success, and we shall be almost astonished to find that few epidemics can be so easily warded off as those of cholera, if only we set to work earnestly to do so.

In India, to protect our troops and prevent the spread of cholera among them, the following precautions are taken. When cholera breaks out in a military cantonment in India, the troops are removed from their barracks and marched a distance of a few miles to tents pitched for them on grounds selected for that purpose. When cholera disappears from the cantonment, the barracks are whitewashed and otherwise disinfected; and if the men be free from cholera, they are allowed to return to them. But should cholera still prevail among the troops, once they have reached the encamping-ground, they are again moved to some other locality, some miles right or left from the first camp, and so on, until no fresh cases occur.

As a rule, a few cases break out among the men during the first few days following their departure from the cantonments. But if the cholera camp has been well selected, near shady trees, and supplied with good water, and if proper precautionary measures be taken to avoid the spread of the disease, cholera soon dies out; and although the men are at times exposed to excessive heat or to heavy rains, not only do they keep free from cholera, but for a while remain in good health generally.

In these instances, which are yearly repeated in many parts of India, how can we account for the disappearance of the disease? The meteorological and atmospherical conditions must be the same a few miles distant from the cantonment as in that locality itself. The troops have left handsome barracks, well ventilated, and built purposely to protect the men from the intense heat of an Indian summer; their food is

the same; their occupations are but little changed; and every possible sanitary precaution is taken in one case as in the other to destroy the choleraic poison and arrest its propagation, Wherein, then, resides the danger in one locality, from which another one so near is entirely free?

The principal condition that has been altered is the drinking-water. If the water with which the cholera camp be provided be pure, then no fresh cases break out; if this water be allowed to be contaminated by cholera discharges, or if it was already tainted before the arrival of the troops, cholera will still continue to prevail among them, and another move will be necessary. Not to be too exclusive to this all-important cause, contaminated drinking-water, I will add, as conducive to the disappearance of cholera from among the troops, the more perfect ventilation of tents over barracks; the moral

effect the change has over the men, and the feeling of security it induces; and, lastly, the more complete sanitary measures which are attended to in cholera camps.

The drinking-water used by the men is protected from all sources of contamination; it is, moreover, filtered (sometimes boiled) before being distributed. The slightest cases of *malaise* and of diarrhœa are treated; and should they not yield readily to medicines, these cases are removed to tents pitched for the purpose to leeward of the camp. All cholera discharges are first disinfected, and afterwards buried at some distance, and to leeward of the camp. Bedding and clothing soiled with choleraic discharges are destroyed. Strict precautions are taken to prevent the men from committing excesses, and eating indigestible or unwholesome food. Debilitating causes, such as fatigue, watching, exposure, are carefully avoided.

Dr. Murray* is strongly in favour of removal. He states: 'The importance of this subject has attracted much attention of late years, and its interest will be increased by the extension of the disease to Europe and America. Where it is to be expected cholera will continue a permanent resident, as in India, there is no point in the treatment of the disease on which the opinion expressed in the reports is more decided or so unanimous. Removal is considered one of the most efficacious means available for saving life during cholera epidemics.'

When ordinary sanitary measures cannot be applied, much benefit arises from abandoning the locality where cholera is raging, and moving in the direction of running streams, marching against their current (provided cholera does not exist at the time on the banks of the stream), and isolating fresh cases as they break out by

* Loc. cit.

means of temporary hospitals left in the rear. These means are specially applicable to large bodies of men.

Whilst I was on special duty in Abyssinia, cholera gained the camp of the Emperor Theodore, where it was brought by recruits from Tigré, in May 1866. This disease had been making havoc in Tigré. We were not surprised, therefore, to hear that it had spread over other provinces, and that several cases had already broken out in Kourata, a town situate on the lake Tana. The king's camp was pitched in a very unhealthy situation, on a low, swampy ground. Fever, diarrhœa, and dysentery had prevailed to a great extent. The Emperor, in the hope of arresting the spread of the epidemic, moved his camp to the neighbourhood of Kourata. A worse place he could not have selected. He first encamped on a low promontory south of Kourata, but cholera had by this

time broken out in the camp, and hundreds were dying daily. He again moved his camp, this time to some high ground a mile or so north of the town.

The church was so completely choked up with dead bodies that no more could be admitted, and the adjoining streets offered the sad sight of countless corpses, surrounded by the sorrowing relatives, awaiting for days and nights the hallowed grave in the now crowded cemetery. At last the Emperor asked for my advice. I told him to proceed at once by different routes and follow the many small streams that flow from the highland of Begemder; to protect from pollution the water used for drinking; and once on the plateau, to break up his army as far as possible, selecting a few healthy and isolated localities, where every fresh case that broke out should be sent. He acted upon this advice, and before long he had the satisfaction

of seeing the epidemic lose its virulence, and before many weeks, disappear entirely.

But with better means at our disposal, and in a land where, thanks to English administration, every sanitary measure at our command can be put to use, results far more satisfactory can be obtained, as the following instance fully testifies :

Cholera had been raging during May and June 1872, in the Mahratta country, a well populated district, stretching from the eastern slope of the Bombay Ghauts. The altitude of this plateau averages 2,000 feet above the level of the sea. It is mostly composed of laterite ; well cultivated, sparsely wooded, possessing a few running streams, more or less dried up in the hot weather, and a moderate rainfall for India. We had learned from the reports of the police and civil officers in charge of the districts that the epidemic was of a most virulent type. Some medical subordinates were sent to

the localities most infected, and they confirmed the great extent and the severe character of the outbreak. I was at the time Civil Surgeon of Sattara, a town of some 23,000 inhabitants, and formerly the capital of the territories of the Rajah of Sattara. Informed of the progress of the epidemic in the direction of Sattara, with the assistance of the civil authorities, the following sanitary measures were carried out. The whole town was thoroughly inspected, filth and rubbish were carted and burnt to leeward of the town, drains were flushed, houses were whitewashed, gardens cleared out, and all excrementitious matters removed to trenches dug for that purpose near the city, and filled with earth. Policemen were stationed at the different roads leading to the city, provided with medicine to distribute to any person suffering from diarrhœa, and directed to accompany to a building set apart for the purpose any case of cholera

that should be reported to them. The town fortunately receives an excellent supply of drinking-water from a small lake, situate on a hill in the vicinity of Sattara. Policemen were posted at the reservoir which receives this water; the place around was kept clean and dry, and no one allowed to bathe or to wash clothes at it or in its vicinity. The inhabitants were warned not to use the water of their wells for drinking purposes, but to fetch it from the reservoir. They were also told to apply for medicine on the first appearance of diarrhœa, and that every case of cholera that declared itself in the town should be taken to the hospital, and that myself or my subordinates should be informed of the occurrence, when some one belonging to the hospital staff would visit the patient.

In the beginning of July, a few cases were admitted into the cholera hospital, one or two a day, during some eight or ten days. Every

one of these cases had been contracted in the villages south of Sattara, the district where cholera was at the time prevailing. All the discharges of the cholera patients were at once saturated with disinfectants, and buried in trenches dug for the purpose, and the clothes and bedding of all were destroyed. A good ventilation, fires, and disinfectants were used in and around the cholera ward.

We had a lull of about ten days, when again a few more cases were admitted; this time the disease had been contracted in the villages north of Sattara. I need not say that the same sanitary measures were taken in these as in the former cases.

Sattara is surrounded by villages; in all of them cholera raged for several weeks, yet not a case broke out in our city. About a mile from Sattara there is a military cantonment, at the time composed of a native regiment, two com-

panies of European troops, civil and military officers, with their families and servants, and a large native bazaar; not even a case of diarrhœa was reported in the camp. It is true that the cantonment was doubly protected: first, by the precautions we had taken in the town, a quarantine of supervision, not of exclusion, as every one could come and go freely; secondly, by a strict quarantine enforced around the cantonment itself. In this case it was complete; as long as a single case of cholera remained under treatment at the hospital, and for some days afterwards, no communications were allowed between the town and camp.

I wish to bring prominently to notice the following facts: The disease, in the first batch of admissions from cholera, had been contracted in the villages south of Sattara; for a few days no admissions took place: then a few more were admitted—this time the disease had been con-

tracted north of Sattara. We remained free from the disease, though in the very centre of the cholera wave; following man, it had turned round Sattara without being able to do us any harm. Not a single case was contracted in Sattara itself. In every instance we traced the disease to infected localities. There is not the slightest doubt that, if energetic sanitary measures had not been vigorously carried out, cholera would, as in former epidemics, have claimed many victims in the unprotected city.

The description I have just given of the sanitary measures applied to bodies of men and towns will suffice. It would be useless to repeat the same advice under different words. Doubtless their application will be attended with more difficulties in Europe, until every one is convinced of their great importance, and their usefulness appreciated by the most ignorant peasant.

Individual prophylaxis is simple and easy. Let every one attend carefully to the following rules: Be moderate in all things; avoid indigestible and damaged food, unripe fruits, and every kind of excesses; above all things, banish fear—with a feeling of confidence in the precautions you take, go through your usual daily routine. Excess, indigestion, or fear do not cause cholera, but one and all favour the development of the poison once introduced into the system. There can be no doubt that during the prevalence of cholera a great many persons are affected by the cholera-poison; but in many of them the individual resists its action, and no evil consequences follow. For these reasons, excesses and constant anxiety for one's self can be but very injurious at a time when all the vital energies are required, and the healthy working of the whole system so much needed.

But I cannot too much insist on this point—

beware of the water you drink, as long as cholera prevails in the locality in which you reside.

In Europe it is always easy to obtain pure water, which should be exclusively used during the prevalence of the epidemic. Unfortunately, the poor will not be able to drink nothing but aerated water—the so-called soda-water, or the waters of St. Galmier and of St. Albin; but to those who can afford this trifling expense, I could not too strongly recommend this precaution. Many times in India I have had my tea or coffee prepared with aerated water, which had been purchased in localities where cholera did not exist at the time.

Suspicious water should never be used, although it has been stated that any water filtered and boiled, and partaken of before it gets cold again, cannot be injurious. Had I to put up with such water, I would add to it, before boiling and filtering, a proportion of chloralum, one part

to forty. Cold and aerateddistilled water should be preferred to any other when procurable; indeed, in poor localities, such a supply should be placed at the disposal of the less wealthy.

Avoid over-crowding; freely ventilate the room occupied by a cholera patient; carefully destroy the poison contained in the choleraic discharges; to this purpose pour in all vessels in which they are received a certain quantity of disinfectants; many of these agents are very valuable, but from personal experience I prefer chloralum—a solution of chloride of aluminium. This solution in its natural condition should be frequently sprinkled in the room occupied by a cholera patient; cloths soaked in this solution should be hung in different parts of the room, and a large sheet at the door communicating with the apartment; all stains made by the discharges on the floor or furniture should be thoroughly washed off with the liquid chlor-

alum; chloralum powder should be thrown over the discharges before removal, and also placed between a double sheet under the patient when involuntary stools take place. Linen, clothes, &c., which have been used by cholera patients should be at once soaked in boiling water containing chloralum, in the proportion of one to twenty; great care should be taken not to leave them undisinfected, or even to wash them in simple warm water.

In a recent number of the *Sanitarian*, a new and well-conducted monthly journal, published at New York and Chicago, Dr. Hamilton observes,* regarding the epidemic which prevailed in 1866 at Blackwell Island, that the infected clothing, instead of being at once placed in boiling water, was submerged in cold water for a few hours, often over night, and then treated with hot water; the result of this omission was that, of thirty-

* *Lancet*, August 9, 1873.

four women employed in the laundry, twelve died—thirty-five per cent of the whole number.

Protection to all, protection to the individual, such are the results obtained by our actual knowledge of cholera, communicated by man through the choleraic discharges; his breath, his touch, are free from all danger. By following carefully the sanitary measures I have recommended, we need not fly from the presence of a cholera patient; we can nurse him with the tenderness of affection and of love, and surround him with the constant care and attendance his condition so greatly requires. He is not a source of danger, unless we are ignorant or careless; warned as we are by numerous and well-ascertained facts, ignorance and carelessness can no longer be deemed faults—they are crimes, which it is our duty to reveal and condemn, every one of us, whatever may be our position and station in life.

CHAPTER III.

THE SYMPTOMS AND TREATMENT OF CHOLERA.

Dr. John Murray's official report on the treatment of Asiatic cholera is by far the most practical and the most complete treatise that has appeared on this subject. Added to his own great personal experience, it includes a summary of the opinion of more than 500 medical officers serving in India, and who have all a practical knowledge of the disease. Whilst following the text closely, I will merely examine the most important points, and not discuss the value of doubtful remedies. I will indicate the best and most generally accepted methods of treatment, point out the reasons why some medicines are justly condemned, and

add to these precepts the results of my own experience.

The treatment of cholera varies according to the stage of the disease. These stages are: 'malaise,' 'diarrhœa,' 'collapse,' and 'reaction.'

The symptoms of the various stages are so graphically described by Dr. Murray in the above-mentioned report, that I will give them here verbatim.

In the mildest form of the attack there is a dull feeling of depression or malaise, with sinking at the epigastrium, and want of appetite, torpor of the bowels, with a desire for stimulants. These symptoms are felt by almost all who are in contact with cholera patients in severe epidemics. During this period, if the person be subjected to great exhaustion, from a long march, from exposure, from watching or fear, or if a strong purgative be given, the

usual symptoms of cholera with collapse will supervene. Many such instances have come under my observation, and many more have been reported. The poison was in the system, and brought into activity by the depressing or exhausting influence superadded, instead of being quietly thrown off, as in general, by the healthy natural secretions.

This depression of spirits naturally calls for the ordinary remedies, viz. brandy or wine, which in moderation is not injurious; but moderation is rare when panic is present. Excess should be guarded against with special care, and this will be aided by considering malaise as the first stage of the disease. The action of the poison is depressing on the nervous system, and the indications of treatment are to support the strength by gentle stimulants and tonics, till the poison is changed by running its course, being digested or simply

passed off with other extraneous admixtures with the blood.

The precautionary measures consist of carefully avoiding exhaustion and purgatives. The medicines required are anodynes or opiates, carminatives and tonics, wine in moderation, and nourishing diet, with little change from routine.

Cases of diarrhœa abound during cholera epidemics. When the evacuations become more watery—rice-water stools—with cramps, the disease gets the name of choleraic diarrhœa. These symptoms generally precede the rice-water stools with collapse, which are considered to constitute cholera. Choleraic diarrhœa is a stage of cholera as much as collapse; the name should be discontinued, as liable to lead to the neglect of the precautions required to prevent the spread of the disease. There are numerous instances, recorded by the highest and most

reliable authorities, of intense attacks of epidemic cholera appearing immediately after the arrival of people who were suffering from diarrhœa, who came from places where cholera was raging.

The indications of treatment are the same as in the stage of malaise.

As the poison is contained in the evacuations, it would appear theoretically that purgative medicines were the best means indicated for assisting nature; but experience teaches that there are other and safer channels through which the poison may be eliminated, and that purgatives are most dangerous. Their action is very liable to be followed by rice-water stools and collapse, during which medicine has little power; whilst during the previous stage of diarrhœa few medicines are found more beneficial than opiates and anodynes. The explanation appears to be, that the poison, or the secrétion caused by it, is of an irritating nature to the

mucous membrane of the intestines, and that opiates soothe or lull the irritation during the period the poison is passing; whilst purgatives add to the irritation, and thus increase the power of the poison in producing collapse. It is therefore of vital importance to ward off this stage, even should the process detain the poison, a most dangerous inmate, but in a controllable form.

Choleraic diarrhœa is generally classed as the first stage of cholera. I entirely agree with Dr. Murray in considering it as the second stage. I insist on this classification, because I deem it of the greatest practical value. The first stage of cholera includes the condition of malaise, with torpor of the bowels, or natural evacuations. This is the mildest form of the disease. Malaise may exist with simple bilious or watery diarrhœa; this is a more severe form of the first stage of cholera, but it is not usually acknow-

ledged as such, but rather as a premonitory diarrhœa, a diarrhœa of warning. We have in both cases to deal with cholera. The evacuations contain the poison of cholera, and, as we have already mentioned, they are probably one of the most dangerous media of its propagation.

The symptoms of the second stage, or choleraic diarrhœa, are the following: Copious, light-coloured, painless purging; the stools gradually become more watery, and at length colourless, like water in which rice has been boiled. There is often uneasiness in the stomach, like heart-burn, with occasional vomiting and cramps. The signs of malaise continue; the pulse is feeble, and the breath cold, the countenance dark and eyes congested. This stage lasts from a few hours to a week or ten days. The watery stools are sometimes preceded by bilious vomiting and purging, with headache and febrile symptoms; the secretion of urine is scanty, and

wandering cramps are felt in the extremities. There is here, in addition to the diminished action of the sympathetic nerves, the supervention of irritation of the mucous membrane of the intestines, with disturbance of the nervous system generally.

The indications of cure are to remove or dilute any extraneous or specific irritant, to soothe the irritation of the mucous surface of the intestines, support the strength, and promote the secretions of the liver, kidneys, and skin. The nervous system, though enfeebled, is still sensible and amenable to the ordinary action of medicines. The variety of remedies recommended on theoretical and empirical grounds is very considerable.

The symptoms in the earlier stages often subside after the use of many different and even antagonistic remedies. It is therefore very important, in determining the value of a

remedy, to consider its influence in the subsequent stages; more particularly as in wide-spread epidemics the exhibition of remedies must be entrusted to people unaccustomed to professional work.

On one important point almost every one agrees: the treatment of cholera should be early, no time should be lost, every case of malaise, with or without diarrhœa, should be looked upon with suspicion: a few quickly repeated stools should, even in the absence of malaise, be at once checked. Opium is in these stages our best and most reliable medicine. The pills used in India by Dr. Murray since 1838, and composed of opium one part, black pepper two parts, and assafœtida three parts, have given him and myself excellent results; they should be largely distributed in localities invaded by cholera, accompanied by simple instructions and advice as to diet, rest, &c.

A mixture of chloroform and opium, or chlorodyne, has given me great satisfaction.*

Great care should, however, be taken that no drugs containing opium be administered as the case is bordering on collapse, or during that stage. Opium acts favourably in the early stages of cholera; doubtless, it soothes the irritation caused by the presence of the poison, or by the secretion it provokes, and arrests the more violent excitation of the system which the poison, left to its own action, will most certainly induce. Opiates thus employed are but symptomatic remedies; but the experience of the many has decided in their favour, and the great importance of an early treatment, in which opiates take the prominent part, cannot be too well and too widely known.

* The chloralum mixture, I recommend, should *always* be given in the first stage of the disease, together with the opiates above mentioned.

Together with opium, diffusible stimulants, such as peppermint-water, ether, brandy, infusion of chillies, &c., find their employ, but alcoholic stimulants, whether wine, brandy, or champagne, should be dealt with sparingly. They should be given to relieve the nervous system, and restore its clouded energies; but in excess this excitation is followed by much prostration, and they introduce into the blood substances which its reduced state of oxygenation renders dangerous and deleterious.

There is no known antidote for the cholera poison, though, according to Dr. Murray, but few substances have not been tried; those, he adds, which prevent fermentation or putrefaction have been strongly recommended, but hitherto tried without success. These unfavourable results should not deter us from further trials. The fact that substances which prevent fermentation or putrefaction have been strongly re-

commended by men daily called upon to treat cholera made a strong impression upon me. If the poison of cholera be an organic matter, evidently the antidote will be found among those substances which arrest its development. What is required is an agent which, whilst it arrests the decomposition of organic matter, will not prove injurious to the system, and which will not act unfavourably on the ulterior stages of cholera. These conditions are realised in the chloride of aluminium.

This chemical agent destroys the poisonous principle contained in the choleraic discharges, and there can be no reason why it should not act on the poison in the human body—at least, reduce and limit its action. Chloralum,* diluted with water in proper proportions, taken internally, cannot do harm, nor will it have any

* I had previously administered chloralum internally, and with great success, in several contagious diseases.—H. B.

bad effects on the ulterior progress of the disease, or act injuriously on the subsequent stages. These facts are already greatly in its favour.

Unfortunately, I did not give it a trial before the end of the epidemic which I witnessed last year at Sattara. I administered it in three cases, all of them admitted into the hospital in a stage of collapse. Chloralum mixture was administered by the mouth, by enema, and was frequently sprinkled around the patients. Warm clothing, friction, ice, iced milk with pepsine, were, with the chloralum mixture, the treatment employed. One of the patients, on account of caste prejudices, took so little of the chloralum mixture that the remedy could not possibly have any action in his case. He died. The other two, who took large doses of chloralum, recovered. This result may be considered as a mere coincidence, aware, as we are, of the limited action of

drugs in deep collapse; but in such cases I do not think that absorption has much influence, and I trusted more to the localised effects of the chloralum on the poison contained in the intestines and stomach. However, so much may be said for this remedy, that these were the only two cases that recovered from among those that were admitted into the hospital during that epidemic.*

I deem chloralum very valuable in cholera, and cannot too strongly recommend a further trial of this remedy. It should be given in the proportion above stated, in the early stages, together with the Indian pills, or chlorodyne. I am convinced that the joint action of these remedies, assisted by a proper diet, rest, and quietness, will considerably reduce the number of cases that proceed to collapse, and even in that stage will save many a life apparently hopelessly lost.

* *Nota.* For a detailed account of the cases, see the *Lancet*, August 16, 1873.

If the experienced authors I have consulted, and if I myself also, be not wrong in the estimate of the causes and of the propagation of cholera, it is certainly among medicines possessing the properties of chloralum that the antidote to the cholera poison will be found, and this agent seems to possess the principal conditions required of it. Professor Gamgee, who has introduced chloride of aluminium as a disinfectant, states that chloralum shrivels, arrests the movements, and kills amœbiform bodies, and does more—it destroys many of the lower forms of parasitic life, whether animal or vegetable. He is convinced that every good antiseptic is really a destroyer of disease. In the *Lancet* of September 30, 1871, we find the following: 'Chloralum (solution of chloride of aluminium) will acidify ordinary sewage, and destroy its living organisms, when added in the proportion of one part to forty.'

In the cases in which I administered chloralum internally, I had a mixture made containing twenty-five parts of water to one of chloralum. I directed that an ounce of this mixture be given, iced, every half hour, and hot enemas of sixteen ounces of the mixture every hour. I had some of this mixture distributed in some of the villages where cholera was prevalent; and although it is very difficult to form an opinion on medicines administered in these conditions, still I am happy to record that in these villages the death-rate from cholera fell considerably.

The symptoms of the stage of collapse are: extreme prostration, feeble pulse, broken voice, oppressed breathing, shrunken skin, with loss of its elasticity, burning pain in the epigastrium, generally accompanied by evacuations of a watery or rice-water appearance (with a mawkish smell), and cramps in the extremities.

There are some cases where human skill is powerless, and there is a similar advanced stage in all fatal cases, but these are rarely met with without other stages having been passed through in which the course of the disease might have been arrested and this stage warded off. Even in the most hopeless cases, though life may not be preserved, much distress and agony may be alleviated. In less intense cases, many lives are saved by judicious treatment, where a fatal result would have followed neglect or improper treatment.

The indications of treatment in this third stage are :

1st. To relieve prominent symptoms and restore warmth.

2nd. To support the strength and avoid exhaustion.

3rd. To the above indications given by Dr. Murray I will add : to destroy,

or at least limit, the action of the choleraic poison.

To those who wish to form an idea of the considerable number of drugs by turn praised and condemned that have been administered in this stage of cholera, I must refer to some classical work on this disease—such as Dr. Macpherson's,* where they will find, if not a complete, at all events a goodly list of such nostrums. I will limit myself to the mention of the treatment which, according to the best authorities and to my own experience, gives the best results. The remedies to which we should trust in the stage of collapse are: Ice, iced water, or iced aerated water, to which should be added chloralum in the proportion of one to twenty-five of water; warm enemas, containing chloralum in the same proportion; artificial heat around the body, by means of hot air passed

* Macpherson, loc. cit.

under the blankets, or hot bricks, warm bottles, &c.; ice to the spine; friction on the limbs with mustard, or, better still, simple shampooing, sinapisms on the stomach. These means, with careful and intelligent nursing, constitute the safest and the most efficacious treatment. By it we soothe the irritation caused by the poison, we meet the indications of the symptoms of the disease, destroy or limit the action of the poison, and, what is equally important, this treatment does not act unfavourably on the stage of reaction. When opium or alcoholic stimulants or violent remedies have been administered in this stage, the reaction is always attended by dangerous consequences.

At the same time, we must support the strength. Unfortunately, we can place little confidence in the digestive powers; like all functions depending on the ganglionary system, it is in great part suspended.

According to Dr. Murray, the cold extract of meat recommended by Liebig is by far the most valuable article of food in this stage, especially when the collapse is prolonged. I prefer iced milk, to which a certain quantity of pepsine is added. Small doses of brandy or wine are sometimes given with advantage in this stage; but the cases in which reaction is established without their administration, in them convalescence is more satisfactory.

Dr. Murray remarks: 'Little suspecting that the means employed extinguish the last hope of the patient's recovery, it has been in protracted and helpless cases that the fatal practice of increasing the quantity of brandy and wine and the use of violent remedies has been resorted to, in the anxious desire of rescuing a hopeless case by desperate means.'

Reaction is a natural stage in the course of the disease. The restlessness subsides, the burning

thirst disappears, the pulse with warmth returns, the rice-water evacuations subside and become coloured, bile appears in the stools, the urine flows, the sleep ensues, nothing but debility remains, which rapidly disappears.

Such are the signs of simple reaction. But when collapse has lasted a long time, or when violent remedies have been given, then reaction is often followed by fevers of a low type, or hindered in its course by local disturbances, caused by the action of the poison or by the remedies employed. For this reason, we have rejected in the treatment of collapse opiates, astringents, and alcoholic stimulants. Although administered during collapse, these remedies begin to act only as reaction sets in, and they add a new poison to the one the patient is struggling to shake off. We should never forget that recovery is possible only after reaction has taken place, and that in every

case of collapse this stage will have to be gone through before the patient's life may be deemed safe. On these grounds, we should avoid administering during collapse violent remedies, or such as bear unfavourably upon the stage of reaction. During the period of collapse most cholera nostrums are, to say the least, useless; but many of them are injurious in that they hinder the full development of reaction, or render it dangerous by its excess.

In the cases in which chloralum was administered, the reaction was all that could be desired—sufficient, yet not excessive. No secondary fever, and no complication of any kind, followed its administration, though it was given in cases where collapse had been intense, and had lasted for a long time. The low fevers, the congestion of important organs, and the other accidents which complicate abnormal reaction, such as irritability of the stomach,

diarrhœa, suppression of urine, &c., come under ordinary treatment, and call for no special remarks here.

I cannot better conclude these notes than by giving the very words with which Dr. Murray sums up his admirable report on the treatment of cholera, and of which I have so greatly availed myself in this last chapter. 'The general opinion of upwards of 500 medical officers of the British and Indian medical services who have had personal experience in treating the disease is nearly unanimous on the sanitary and precautionary measures, and there is a very general concurrence in the indications of treatment and regarding many of the individual remedies. The divergence increases as old practice and recent theoretical remedies pass through their practical ordeal. Bleeding is repudiated; the faith in calomel is gone. Opium is condemned, and so is the

excessive use of alcohol. Acetate of lead is regarded with suspicion, and sulphuric acid with little confidence; and the danger from purgatives is acknowledged. The general impression is, that much good can be done in limiting the ravages of the disease, both in extent and intensity, and many lives saved, by recognising and treating the disease in its earlier stages, and much distress relieved even when life cannot be saved.'

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